

**IN THE CLAIMS**

- 1 1. (currently amended) An apparatus for determining a property of a fluid  
2 downhole comprising:  
3 a resonator associated with the fluid downhole;  
4 a controller ~~for actuating~~ which actuates the resonator;  
5 ~~a monitor for receiving a response from the resonator to the actuation of the~~  
6 ~~resonator such that the response is associated with the fluid; and~~  
7 a processor ~~for estimating~~ which estimates the property for the fluid downhole  
8 using a response of the resonator to the actuation.  
9
- 1 2. (previously presented) The apparatus of claim 1, wherein the processor uses a  
2 chemometric equation for estimating the property.  
3
- 1 3. canceled (previously presented) The downhole tool of claim 2,  
2 wherein the processor applies the resonator response to the chemometric equation  
3 to determine the property.  
4
- 1 4. (previously presented) The apparatus of claim 1 wherein the processor uses a  
2 function for deriving a chemometric equation from measured resonator response  
3 correlated with known fluid property values.  
4
- 1 5. (previously presented) The apparatus of claim 1, wherein the property is viscosity.

2

1 6. (previously presented)The apparatus of claim 1, wherein the property is density.

2

1 7. (previously presented)The apparatus of claim 1, wherein the property is dielectric  
2 constant.

3

1 8. (previously presented)The apparatus of claim 1, wherein the property is  
2 resistivity.

3

1 9. (previously presented)The apparatus of claim 2, wherein the processor applies  
2 the chemometric estimated property to a Levenberg-Marquardt (LM) algorithm to  
3 determine a fluid parameter value for the fluid.

4

1 10. (original) The downhole tool of claim 10, wherein the fluid parameter value  
2 comprises a global minimum for the LM algorithm.

3

1 11. (currently amended) A method for determining a property of a fluid downhole  
2 comprising:

3 interacting with a downhole fluid with a resonator

4 actuating the resonator;

5 receiving a response from the resonator to the actuation of the resonator; and

6 estimating a value of the property of the fluid downhole based on the resonator

7 response.

8

- 1 12. (previously presented)The method of claim 11, further comprising:  
2 estimating the fluid property using a chemometric equation.  
3  
4

- 1 13. canceled (previously presented) The method of claim 11, further comprising:  
2 applying the resonator response to a chemometric equation to determine the  
3 property.  
4

- 1 14. (original) The method of claim 11, further comprising:  
2 deriving a chemometric equation from measured resonator response correlated  
3 with known fluid property values.  
4

- 1 15. (previously presented)The method of claim 11, wherein the property is viscosity.  
2

- 1 16. (previously presented)The method of claim 11, wherein the property is density.  
2

- 1 17. (previously presented)The method of claim 11, wherein the property is dielectric  
2 constant.  
3

- 1 18. (previously presented)The method of claim 11, wherein the property is resistivity  
2

- 1 19. (previously presented)The method of claim 12, further comprising:

2 applying the chemometric estimated parameter value to a Levenberg-Marquardt  
3 (LM) algorithm to determine a fluid parameter value for the fluid.

4

1 20. (previously presented) The method of claim 19, wherein the fluid parameter value  
2 comprises a global minimum for the LM algorithm.

3

1 21-30 (cancelled)

2

1 31. (currently amended) A system for determining the properties of a fluid  
2 comprising:

3 a surface controller which lowers a tool deployed in a well bore formed in an  
4 adjacent formation, the tool interacting with a down hole fluid;

5 a resonator associated with the down whole fluid;

6 a controller for actuating the resonator;

7 ~~a monitor for receiving a response from the resonator to the actuation of the~~

8 ~~resonator such that the response is associated with the fluid; and~~

9 a processor for ~~estimating~~ which estimates a value of a property for the down  
10 ~~whole hole~~ fluid.

11

1 32. (currently amended) The system of claim ~~1~~ 31, ~~further comprising:~~

2 wherein the processor uses a chemometric equation for estimating a fluid

3 the property value.

4

5

1 33. (currently amended) The system of claim ~~12~~ 32, ~~further comprising:~~ wherein the  
2 processor applies a function applying the resonator response to a the  
3 chemometric equation to determine a the fluid property value.

4

1 34. (currently amended) The system of claim ~~1~~ 31, ~~further comprising:~~  
2 wherein the processor uses a function for deriving a chemometric equation  
3 from measured resonator response correlated with known fluid property  
4 values.

5

1 35. (currently amended) The system of claim ~~1~~ 31, wherein the parameter  
2 value property is viscosity.

3

1 36. (currently amended) The system of claim ~~1~~ 31, wherein the parameter value  
2 property is density.

3

1 37. (currently amended) The system of claim ~~1~~ 31, wherein the parameter value  
2 property is dielectric constant.

3

1 38. (currently amended) The system apparatus of claim ~~1~~ 31, wherein the parameter  
2 value property is resistivity.

3

1 39. (currently amended) The system of claim 12, ~~further comprising:~~

2 wherein the processor ~~applying~~ applies the chemometric estimated  
3 parameter value property to a Levenberg-Marquardt (LM) algorithm to  
4 determine a fluid parameter value for the fluid.  
5

1 40. (currently amended) The system of claim ~~40~~ 39, wherein the fluid parameter  
2 value comprises a global minimum for the LM algorithm.  
3

1 41. (new) The apparatus of claim 1 wherein the resonator comprises a mechanical  
2 resonator.  
3

1 42. (new) The apparatus of claim 1 wherein the resonator comprises a tuning fork.